

The NAV CANADA logo consists of a white rectangular bar on the left, followed by the words "NAV CANADA" in a white, sans-serif, all-caps font.

NAV CANADA

ADS-B via Low Earth Orbiting Satellites : Benefits Assessment

A large white Airbus A380 aircraft is shown from a low angle, flying towards the viewer. It has four engines and a red tail fin. The aircraft is positioned behind the title text.

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Director, Operational Support

Bodo, Norway
May 13-17, 2013

S E R V I N G A W O R L D I N M O T I O N



Outline

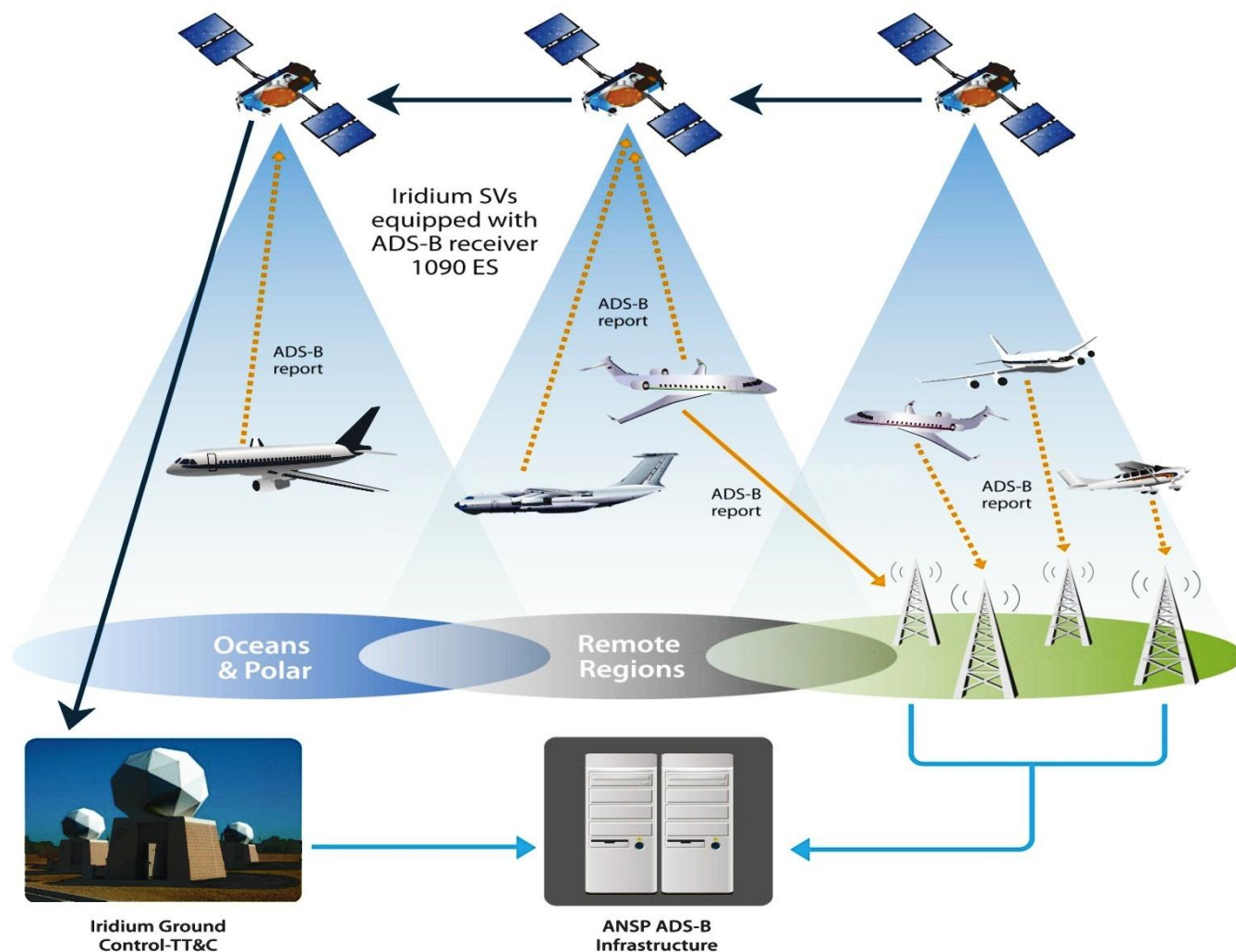
- Global ADS-B via LEO satellites.
- Why the initial focus is on the North Atlantic?
- ADS-B Aireon Benefits & Assessment.
- Going Forward.



Goal

To reduce aircraft separation minima through ADS-B (out) via global Low Earth Orbiting (LEO) Satellites

ADS-B via Low Earth Orbiting (LEO) Satellites

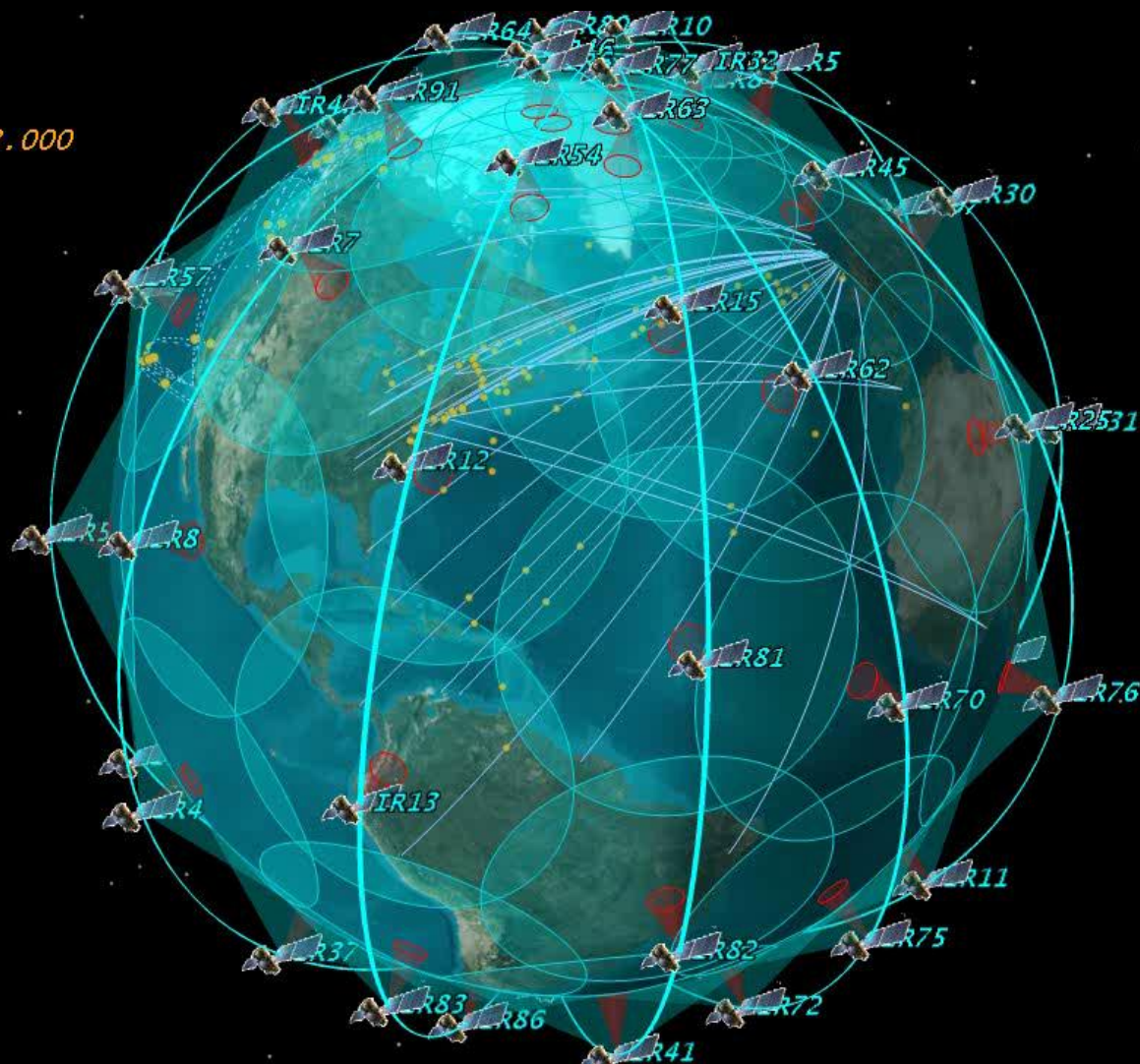




Global ADS-B Surveillance Using Iridium NEXT

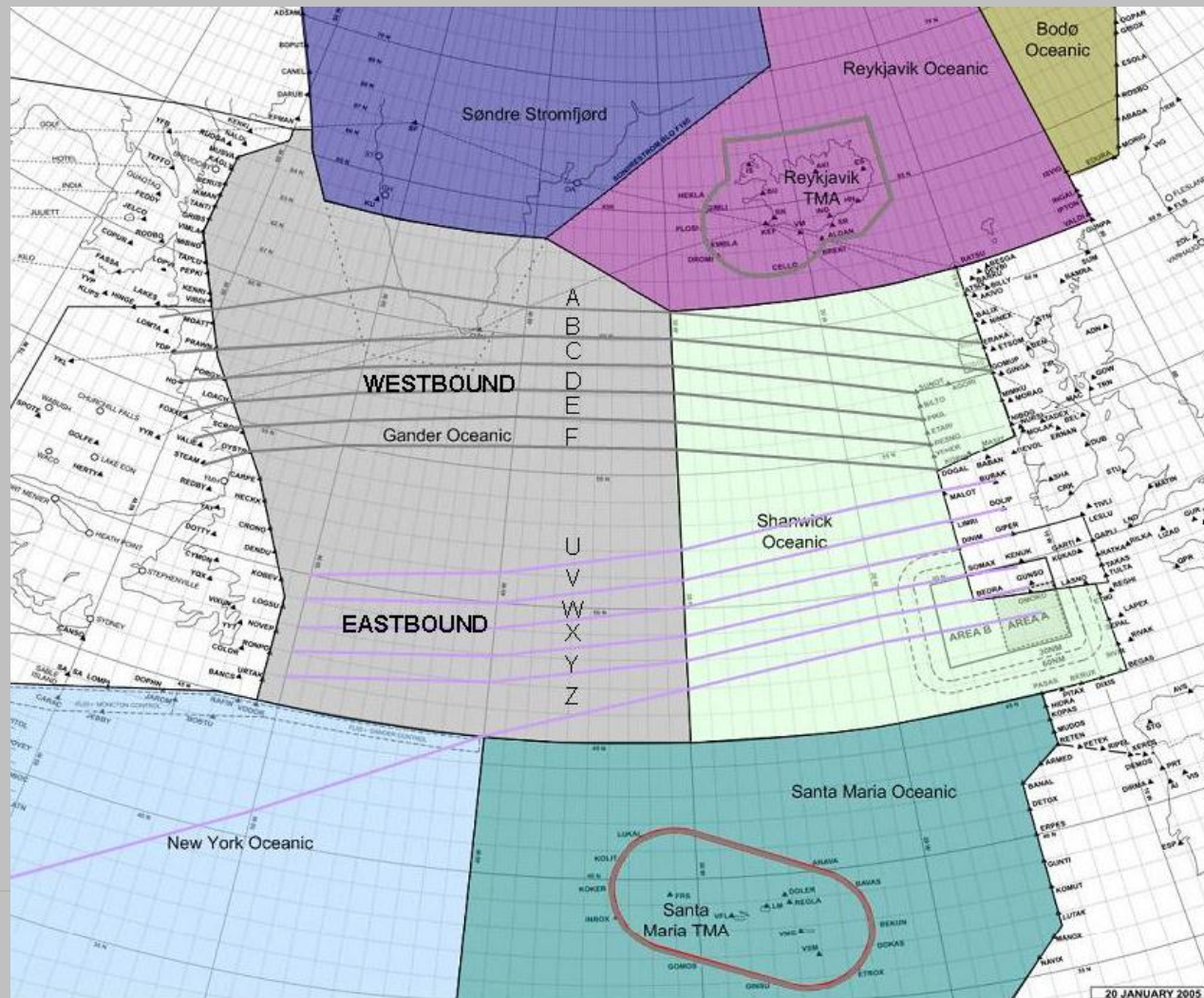
- **Coverage** – provides global, real-time visibility of ADS-B equipped aircraft – everywhere.
- **Extends and Augments Surveillance Coverage** – enhances ADS-B terrestrial infrastructure and avoids or reduces costly investments.
- **Accelerates Harmonization of Aviation Efficiencies** – advances seamless sky.

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Earth Inertial Axes

Focus on North Atlantic Oceanic Airspace



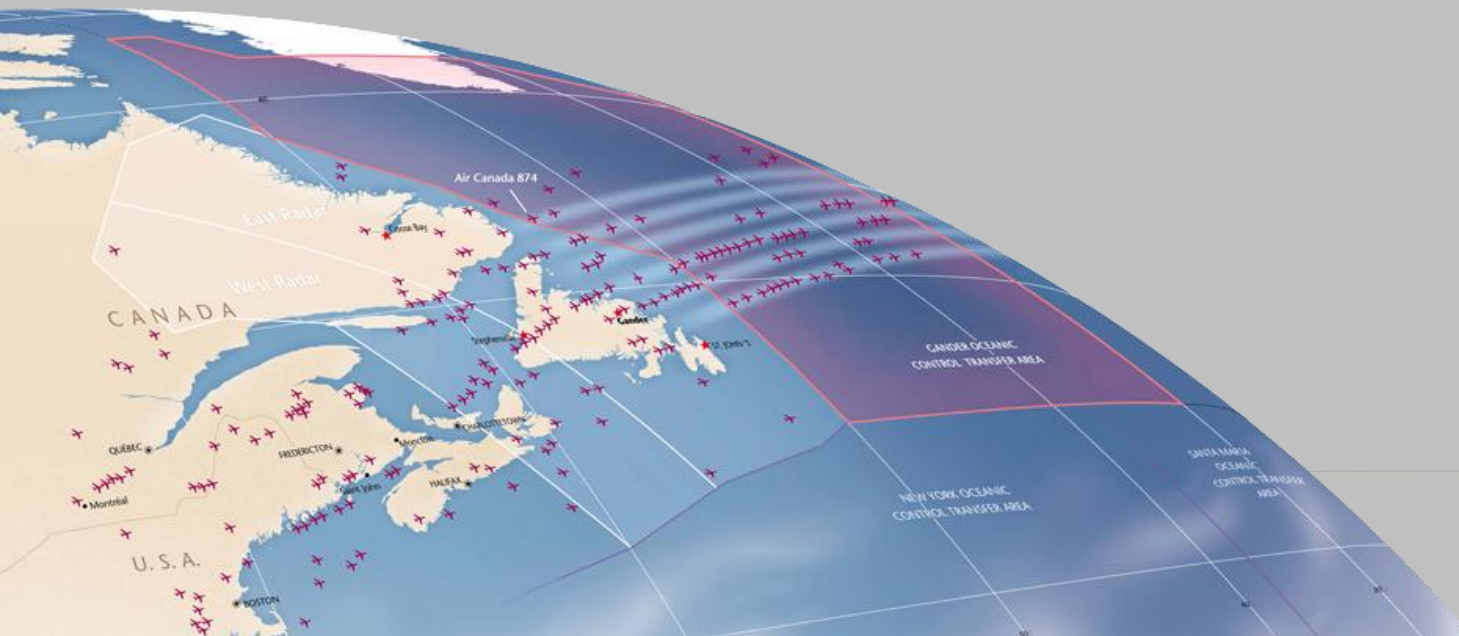
- Organized Track Structure Airspace NAT OTS
- Eastbound Tracks take advantage of tail winds
- Westbound Tracks avoid head winds
- Procedural Airspace = large distances
- Changes to flight levels, routes, speed by exception



Gander/Shanwick Airspace Today (2012)

- **1,000** flights per day (1,300 peak summer day)
- **350,000** commercial flights per year
- **+23,000** military & GA flights per year
- **85%** of the flights are already ADS-B equipped
- **67%** of flights are Data Link (FANS 1/A) equipped
- **67%** are capable and use Controller Pilot Data Link Communications (CPDLC)

Gander, Shanwick Dec 2012





Aireon ADS-B System Benefits

Safety

- ADS-B provides real time aircraft position every 10 seconds
- Improves situational awareness, conflict detection and reaction/resolution
- Aircraft would have more flexibility in emergency situations
- Provides ADS-B surveillance source separate from the communications (CPDLC) network sources
- More complete and accurate reporting of aviation occurrences, allowing better management of safety risk and better support of the Safety Management System



Aireon ADS-B System Benefits

Environmental/Efficiency

- More efficient “domestic-like” flight trajectories in oceanic airspace
- More predictable airline cost planning
- Climb/Descend and vary speed to chase wind push and avoid headwinds
- Improve opposite direction and crossing traffic profiles
- Significant worldwide reductions in greenhouse gas (GHG) emissions and carbon footprint

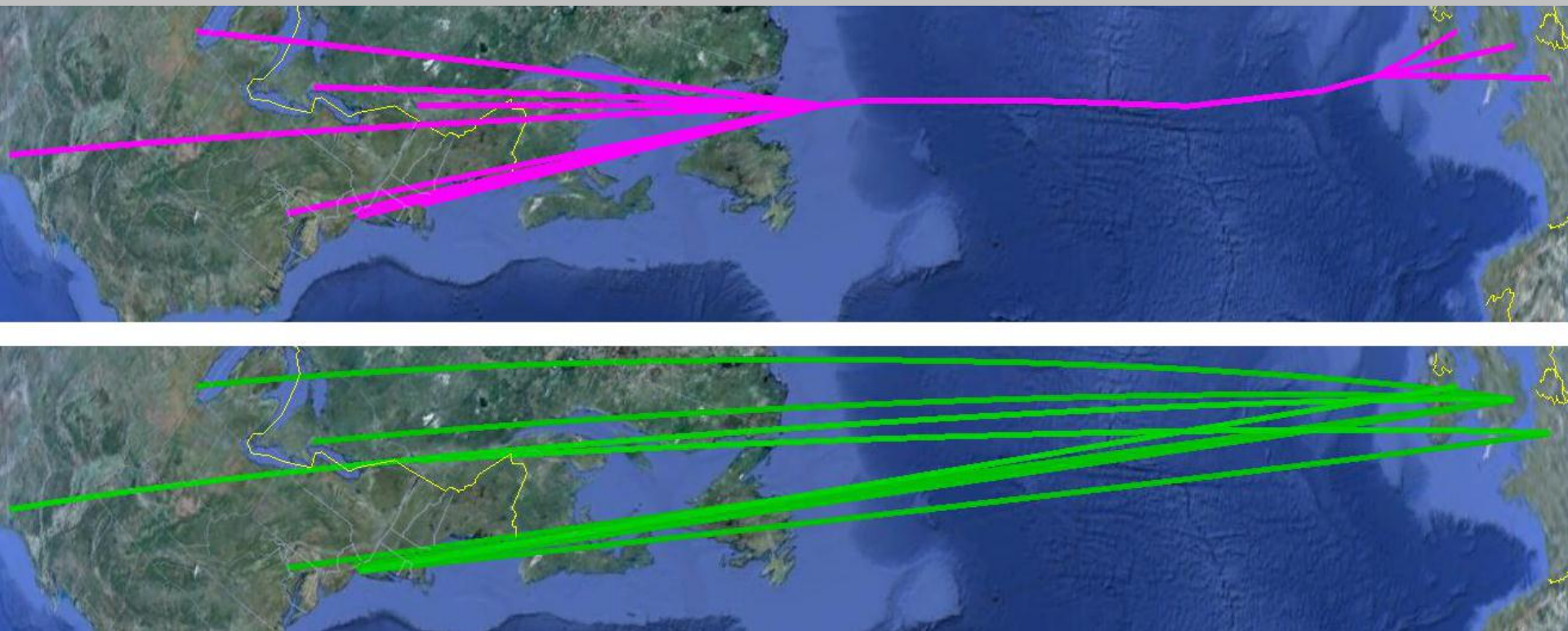


Aireon ADS-B System Benefits

Predictability/Reliability

- Access to ADS-B data could support traffic flow management-sequencing, merging and balancing for major cities in eastern North America and western Europe
- Supports information sharing and collaborative process
- SWIM requires flight planning systems, dispatch, airline gate-to-gate management to become more sophisticated and efficient. Surveillance via LEO satellite ADS-B will accommodate this.

Overview of Traffic on Tracks and No Tracks





LEO ADS-B Benefits Assessment

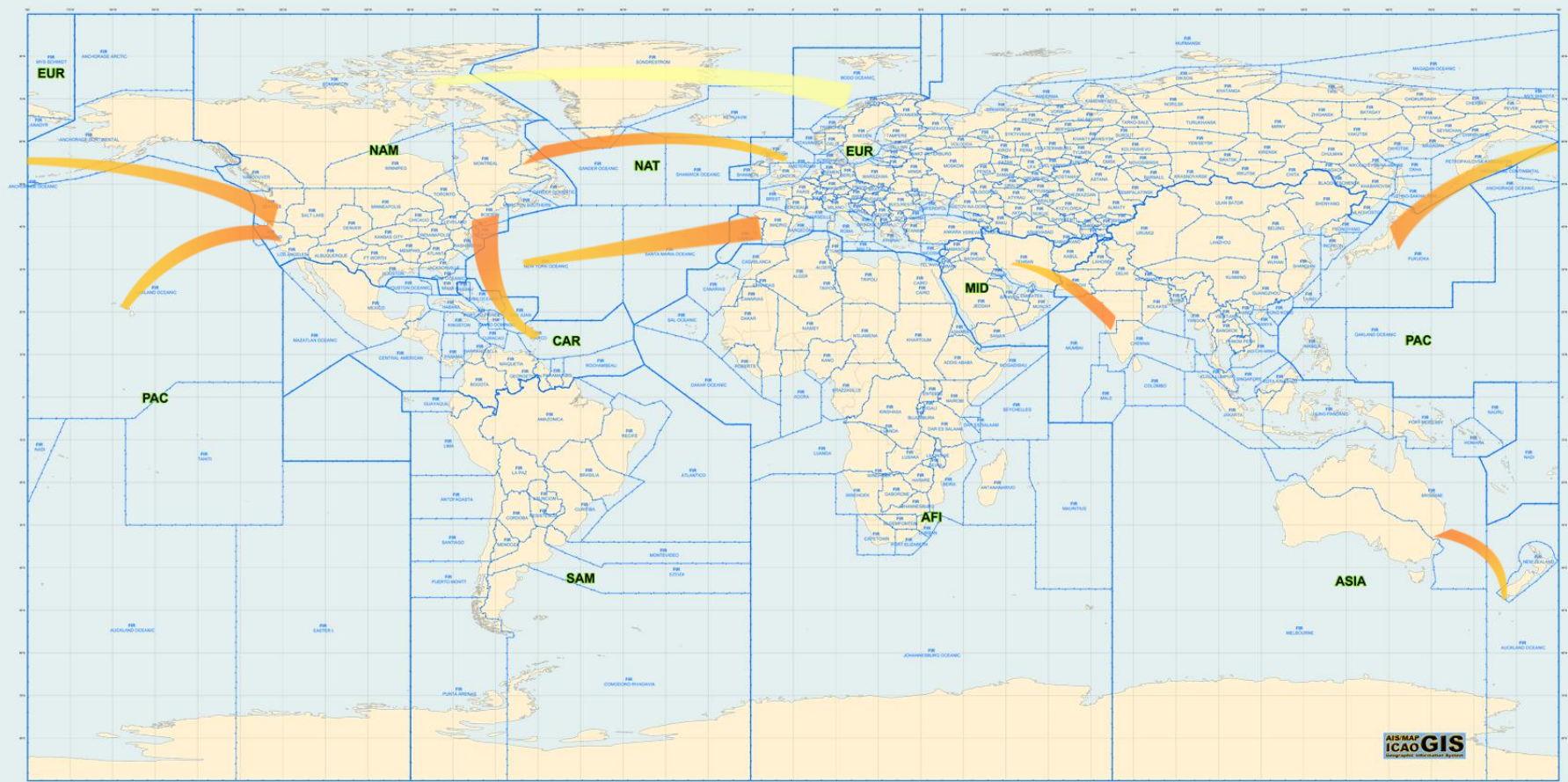
Determine the 2018 (1st year) fuel burn, based on simulation of 600 flights:

1. Base Case with RLongSM & RLatSM.
2. ADS-B Case: 15nm longitudinal & 30nm lateral separation.
3. Compare the Base Case and ADS-B fuel results.
4. Determine the net fuel savings per flight.

Annual Gander/Shanwick Benefits

- A fuel savings of 450 litres was estimated per NAT flight after a thorough and conservative assessment of ADS-B benefits. 600 flights were simulated.
- Consistent with IATA members' savings from the variable speed/Flight Level ENGAGE project.
- Year one benefits estimated at \$127 million for 2018 .

Global Oceanic ADS-B Benefits





Global Oceanic Benefits

- High level assessment of 8 areas.
- Based on 1,000' climb fuel savings.
- Up to 3 climbs per flight.
- Vetted with IATA airline member familiar with oceanic operations.
- Considered conservative and achievable.

Global Oceanic Benefits


Estimated \$439 million in 2018

Major Oceanic FIRs	Commercial IFR Flights (000s)	Total Fuel Climb Savings (000s)	GHGs (000s Tonnes CO ₂ Equiv)
Pacific	131	\$169,776	446.4
Shanwick / Gander	390	\$127,000	332.8
New York-Santa Maria	138	\$64,584	169.8
US Coastal	109	\$7,358	19.3
Tasman Sea	48	\$3,240	8.5
Mumbai	22	\$1,337	3.5
North Atlantic above 65°	46	\$21,528	56.6
South Pacific	20	\$43,920	115.5
	904	\$438,742	1,152.4

LEO ADS-B Benefits Assessment

Conclusions

- ✓ Global ADS-B Surveillance is a “Game Changer” for aviation
- ✓ Fits with NEXT GEN / SESAR
- ✓ Significant fuel & GHG savings
- ✓ Avoids some ADS-B replacement/expansion costs
- ✓ Benefits to domestic traffic can be realized through improved air traffic flow management
- ✓ Public would benefit from safer + more expeditious flights in remote, polar and oceanic airspace worldwide
- ✓ Opportunity to boost aviation innovation & the environment globally



Where do we want to go?

Global ADS-B via LEO Satellites

- A strategic partnership in Aireon
- Support and promote a robust Safety Management System
- Achieve much more flexible and air operator centric operating environment in oceanic, remote and polar airspaces
- Accelerate the harmonization of aviation efficiencies through advances in system wide information management